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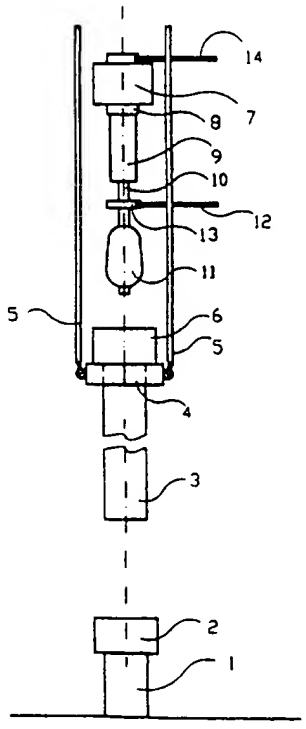
(54) Title: A DEVICE FOR CONNECTING CASINGS

(57) Abstract

A device serves to interconnect pipes (3) to form a casing (1). A new pipe (3) to be added to the top of the casing (1), is suspended from an elevator (4) assigned a drawworks, the latter being assigned a top drive (7) above the elevator (4). The device comprises a tubular hydraulic telescopic device (9, 10), one end thereof being connected to the output shaft (8) of the top drive (7), the other end thereof being provided with a catcher (11) adapted to catch, raise and rotate the pipe (3). The catcher (11) is adapted to be guided into the pipe (3) and to be expanded to rest against the pipe and, thus, to establish an internal friction connection.



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A DEVICE FOR CONNECTING CASINGS

The invention relates to a device for connecting casings.

Oil and gas wells are lined by setting a pipe called a casing which is concreted into position through the supply of a cement slurry to the annulus outside the casing.

The casing is formed by interconnecting shorter pipes screwed one to the other by means of threaded connections. A new pipe is supplied to the top of the casing which, then, is lowered one pipe length down into the well. Before a new pipe can be added to the top of the casing, the latter is refilled with a liquid.

Pipes jointed together to form a coherent casing are, at each end thereof, provided with an external threaded portion, and pipes are added to each other by means of an external socket having internal threads. Before a new pipe is added to the top of the casing, a socket is screwed halfway onto the threaded portion at the upper end of the pipe, so that the socket forms a small extension of the pipe. The new pipe is suspended from a collar, called an elevator, which is closed around the pipe below the socket. The pipe suspended from the socket can be rotated in the elevator.

The elevator is assigned a vigorous drawworks for vertical

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positioning. The pipe is lowered by means of the drawworks until threads at the lower end of the pipe come into contact with the complimentary threads in a socket at the top of the casing. A tool, a spinner, grips and surrounds the pipe and rotates it about its own axis in order to screw the pipe into the socket at the top of the casing. Then, the threaded connection is tightened to the moment prescribed by means of a moment tool. The casing is lowered, suspended from the socket at the upper end of the latest added pipe, down into the well, and the process is repeated, the socket at the upper end of the latest added pipe, now located at the upper end of the casing, being ready to accommodate the end of a new pipe.

The described prior art technique suffers from a plurality of disadvantages. The drawworks is a rough and coarse apparatus having a lifting capacity of several hundred tons. It is difficultt to fine adjust the vertical position, and the threads are readily damaged when a new pipe is lowered towards the top of the casing. As the pipe is screwed into the top of the casing, it is necessary to readjust the position of the elevator, i.e. to lower the elevator. In order to avoid that the threads are rubbed or become damaged in another way, the pipe should be lowered such that there does not arise any significant axial force acting on the threads while the pipe is rotated and screwed to the top of the casing. As mentioned, this is difficult to achieve by means of the drawworks.

The spinner used to screw a new pipe to the top of the casing, is expensive. Also, it is very space-demanding, as it must be capable of surrounding the largest casings in use.

Filling liquid into the casing involves liquid spillage, making the drill floor slippery and dangerous, thus, entailing the need for constant washing down and cleaning.

An object of the invention is to provide a device securing an

improved vertical positioning of a pipe to be screwed to the top of a casing. Another object is to avoid the use of the known spinner tool. Further, it is an object to achieve a simplified filling of liquid into the casing after a new pipe length has been added, and it is also an object to avoid liquid spillage.

The objects are obtained by means of features as defined in the following specification and claims.

According to the invention, a new pipe is suspended from an elevator as previously known. Further, it is presupposed that a top driven rotational system, a socalled "top drive", substantially used for drilling purposes, is assigned to the drawworks at a higher level than the elevator, as previously known.

In accordance with the invention, a tubular telescopic tool is, at one end thereof, adapted to be attached to the top drive's output shaft in a way corresponding to usual drill pipes.

Then, pipes, valves and other components used to supply liquid to drill pipes, may supply liquid to the tubular telescopic tool.

The lower end of the tool is telescopic and provided with a connector adapted to establish a tight connection with the upper end of a pipe suspended from the elevator. Further, the connector is adapted to transfer torsional moments and axial forces to the pipe. Thus, the top drive may rotate the tool and the pipe suspended from the elevator. The pipe may be lifted within the elevator by means of the telescope.

A pipe to be added to the top of a casing, is suspended from the elevator as previously known. The connector is guided down to the upper end of the pipe by means of the telescope and activated. Then, the pipe is raised somewhat by means of

the telescope, the pipe sliding in the elevator which is not raised. The pipe is coarsely positioned above the top of the casing by means of the drawworks. Then, the pipe is lowered down to contact with the casing by means of the telescope and put into rotation by means of the top drive. The pipe is lowered gradually by means of the telescope as it is screwed to the top of the casing. Finally, the threaded connection is tightened to the moment prescribed. Liquid is refilled through a pipe systems usually assigned to the top drive. The connector is released and lifted clear of the top of the pipe, whereafter the casing is lowered into the well as previously known by means of the elevator, the process being repeated for each new pipe.

The tool as indicated above, is further described by means of non-restricting examplary embodiments, reference being made to attached drawings, in which:

Figure 1 shows diagrammatically a side elevational view of an apparatus for connecting casings, a catcher being ready to catch the upper end of a pipe to be added to the top of a casing;

Figure 2 shows the apparatus after the catcher has caught the pipe;

Figure 3 shows the apparatus after the pipe has been raised in the elevator;

Figure 4 shows the apparatus when the pipe is ready to be added to the top of the casing;

Figure 5 shows the apparatus when the pipe is added to the top of the casing;

Figure 6 shows in side elevational view, partly in section and on a larger scale, the catcher gripping the pipe internally.

In figure 1, reference numeral 1 denotes a casing to which to an externally threaded portion at the upper end of the casing 1 is screwed an external socket 2 provided with internal complementary threads. The socket 2 forms an internally threaded extension of the casing 1.

A pipe 3 which at both ends is provided with an externally threaded portion, is suspended with its lower end a short distance above the casing 1 and the socket 2 and is ready to be lowered such that the lower end of the pipe 3 becomes inserted into the upper end of the socket 2 and can be screwed into the socket 2.

The pipe 3 is suspended from an elevator 4 which, by means of bows, hoops or rods 5, is assigned a drawworks, not shown, incorporated in an arrangement common in connection with oil drilling. The elevator 4 is closed around the pipe 3 below a collar 6 which beforehand has been screwed externally onto the upper end of the pipe 3. The collar 6 forms an externally threaded extension of the pipe 3 which is suspended by the collar 6.

A top drive 7 (drilling machine) is, as usually, assigned said drawworks. The output shaft 8 of the top drive 7 is attached to the upper end of a telescopic pipe 9, the length of which can be changed by pushing a pipe member 10, as previously known, out of and into the telescopic pipe 9, preferably by means of a hydraulic actuator, not shown. At the free end of the pipe member 10, a catcher or grapple 11 is disposed. This catcher 11 is adapted to be guided into the pipe 3 and to be expanded to rest against the pipe and, thus, to establish an internal friction connection. Liquid can flow through the telescopic pipe 9 and the pipe member 10, the pipe member 10 opening out below the catcher 11. Necessary energy and control signals to the actuator of the telescopic pipe 9 and to the catcher 11 are supplied through hoses 12 through a swivel device 13. Liquid for refilling the casing

is supplied at the top drive 7 by means of a liquid pipe system 14 used for circulating drill fluid during drilling.

Reference is made to figure 6 where the catcher 11 is shown in section, while it is active within the pipe 3. In the shown embodiment, the catcher 11 consists of a preshaped bellows 15 positioned outside the pipe member 10 and made of an elastic material such as rubber or plastics. At each end thereof, the bellows 15 has a diameter adjusted to the pipe member 10, and elsewhere a diameter somewhat less than the internal diameter of the pipe 3. At its upper and lower end, the bellows 15 is fastened to the pipe member 10 with an upper and lower external clamp 16, 17, so that a closed annulus 18 is formed between the pipe member 10 and the bellows 15. A pipe 19 extending within the pipe member 10, is conducted through the wall of the pipe member 10 and opens up in the annulus 18. Through the supply of pressurized liquid or gas through the pipe 19, the annulus 18 can be pressurized, so that the elastic bellows 15 is expanded for resting against the pipe 3, the pipe 19 being assigned a pressure source, not shown, through the swivel device 13 and one of the hoses 12.

Further, within the pipe member 10 is disposed a pipe 20 opening out at the lower end of the pipe member and communicating with free air above the bellows 15, either through the wall of the pipe member 10 such as shown, through the swivel device 13, or in another way, in order to conduct air out when the pipe 3 is filled with a liquid through the telescopic pipe 9 and the lower pipe member 10.

When a pipe 3 to be added to the top of a casing 1 is suspended from the elevator 4 by the collar 6 in a manner known per se as shown in figure 1, the pressureless bellows 15 is guided down into the pipe by means of the telescopic pipe 9 and the lower pipe member 10 as a result of activation of the hydraulic actuator, not shown, through the hoses 12 and the swivel device 13, se figure 2. The bellows 15 is

pressurized through the pipe 19 as explained, so that the bellows 15 is expanded and forms a vigorous friction connection with the pipe 3. By means of said actuator, the pipe member 10 is pulled up and into the telescopic pipe 9, so that the pipe 3 is raised, sliding within the elevator 4, see figure 3. By means of said drawworks, hoisting pulley block carrying elevator 4 and top drive 7 is lowered until the lower end of the pipe 3 is situated a small distance above the socket 2 at the top of the casing 1, see figure 4. The pipe 3 is lowered further by extending the pipe member 10 out from the telescopic pipe 9 by means of said actuator, so that external threads at the lower end of the pipe 3 comes into engagement with the complimentary threads within the socket 2. The telescopic pipe 9, the pipe member 10 and, thus, also the pipe 3 are rotated about their own axis by means of the top drive 7, so that the pipe 3 is screwed into the socket 2. Simultaneously, the pipe 3 is lowered in step with the screwing as a result of the pipe member's 10 extension out from the telescopic pipe 9 by means of said actuator, see figure 5. Then, the threaded connection is tightened to prescribed moment as previously known by means of a moment tool, not shown. The casing 1, now extended, is lowered into the well and refilled with liquid through the telescopic pipe 9 and the pipe member 10 upon liquid supply from the pipe system 14. The pressure in the annulus 18 is relieved, and the bellows 15 is pulled up from the pipe 3 by pushing the pipe member 10 into the telescopic pipe 9 by means of said actuator, whereafter the process is repeated in order to add yet another pipe to the top of the casing 1.

C l a i m s

1. A device for interconnecting pipes (3,6) to form a casing (1), where a new pipe (3,6) to be added to the top of the casing (1) is brought to be suspended from an elevator (4) assigned a drawworks, and where a top drive (7) or similar drilling machine has been disposed above the elevator (4), the device comprising a pressure fluid operated telescopic pipe device (9,10), the upper end thereof being connected to the downwardly directed output shaft (8) of said top drive/ drilling machine (7), and the lower end thereof carries a catcher (11) adapted to be conveyed a distance into the upper end of said new pipe (3,6) while the latter is suspended from said elevator (4), and to establish a frictional connection exhibiting a torsional strength vis-à-vis an internal pipe portion, in order to enable rotation of said new pipe (3,6) in relation to the casing (1), c h a r a c t e r i z e d i n that said catcher (11) consists of an elastic, inflatable bellows (15) in the form of a preshaped central sleeve portion intermediate tapering end portions attached fluid tightly and with torsional strength to a downwardly extending pipe member (10) incorporated into said telescopic pipe device (9,10) enabling the insertion of the catcher (11) into the upper portion of said new pipe (3,6) as well as the withdrawal therefrom, said bellows (15) being dimensioned for unobstructed insertion/withdrawal in relation to said new pipe (3,6) in an uninflated state and to, in an inflated state, to establish a torsion-resistive friction-based connection with an inner wall portion of said pipe (3,6).

2. A device as set forth in claim 1, c h a r a c t e r i z e d i n that said bellows (15) consists of rubber or rubber-like plastic material or other rubbery substance, respectively, and that its two tapering end portions each isconcluded by an annular outer end, each attached fluid-tightly and with torsional strength to said pipe member (10) of the telescopic pipe device (9,10), preferably by means of a surrounding clamp (16, 17).

3. A device as set forth in claim 1 or 2, c h a r a c t e r i z e d i n that a narrow pressure fluid conveying pipe (19) extends through the telescopic pipe device (9,10) and through the wall of the pipe member (10) as well as opens out at an open end within an annulus-shaped internal cavity (18) externally defined by the bellows (15), thus enabling to pressurize the annulus-shaped cavity (18) or relieve the same, respectively, when said new pipe (3,6) has been screwed firmly to the upper end of the casing (1).

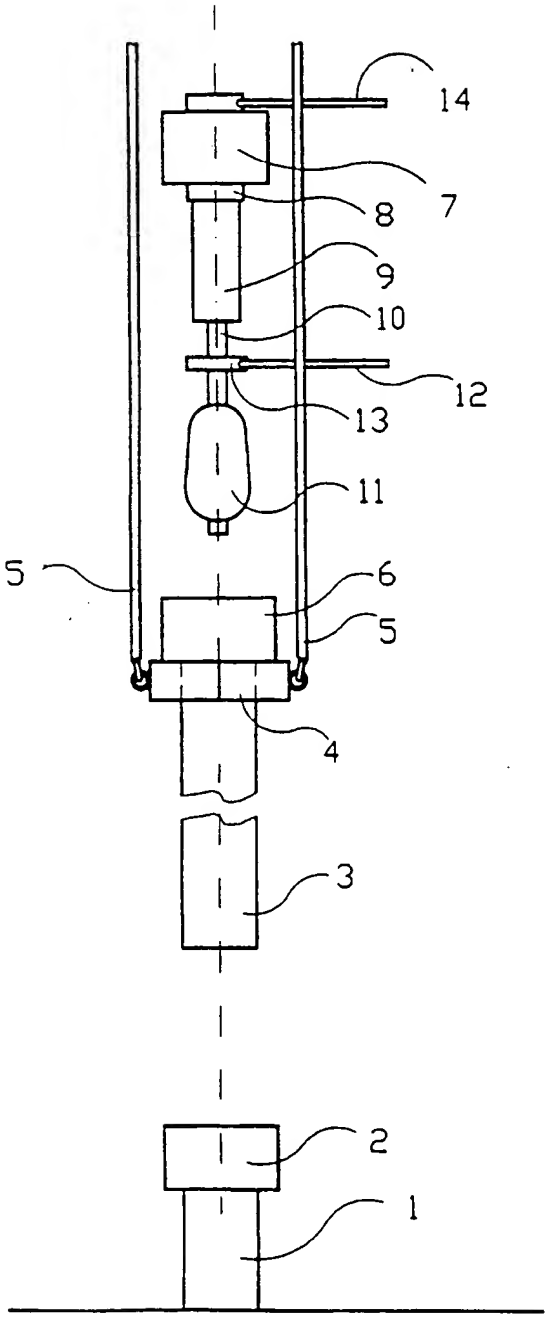

Fig. 1

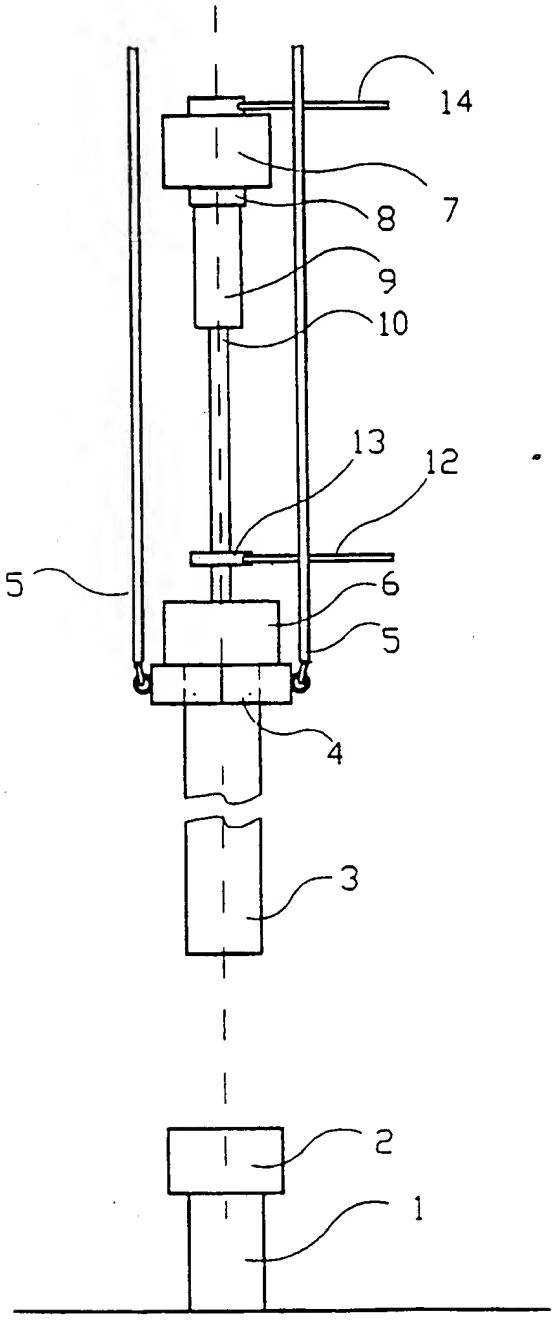

Fig. 2

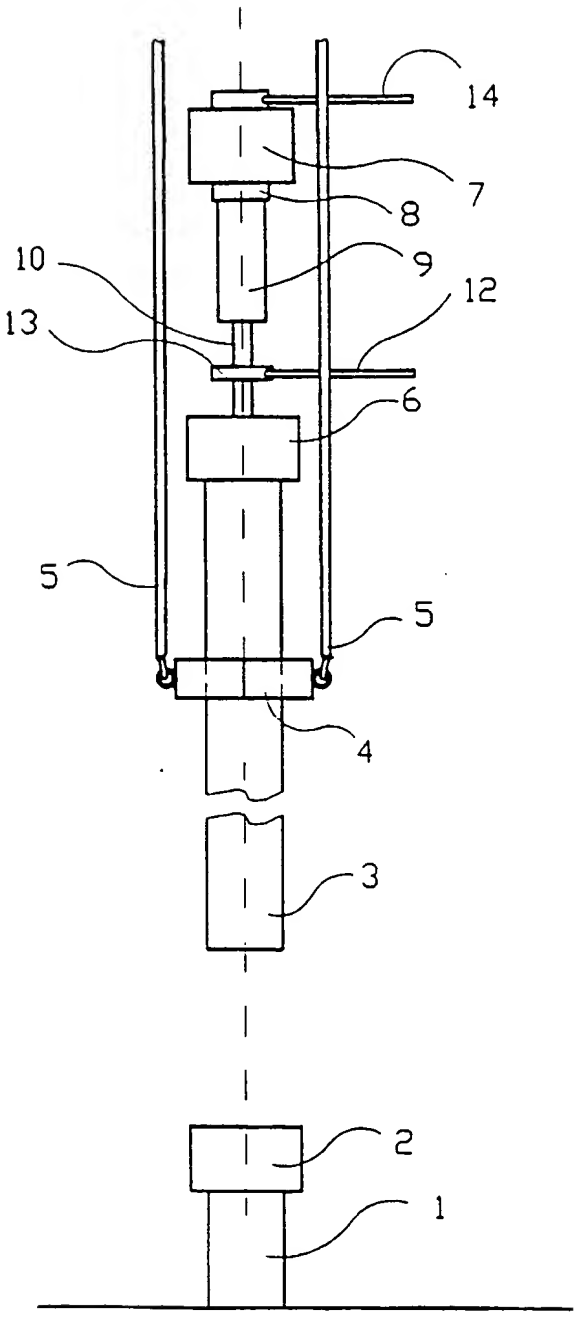

Fig. 3

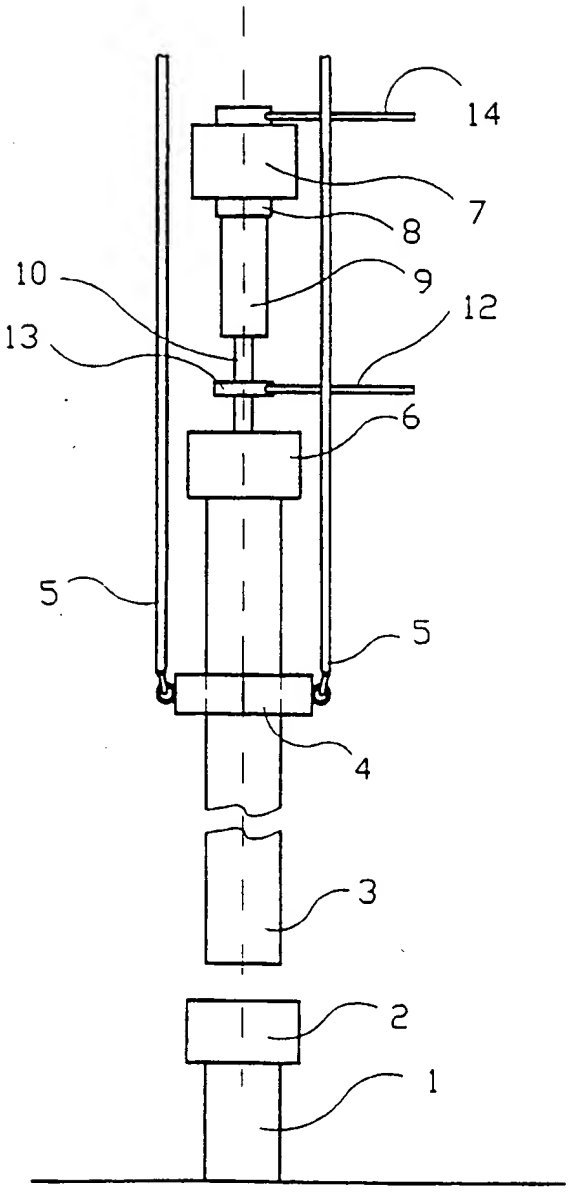

Fig. 4

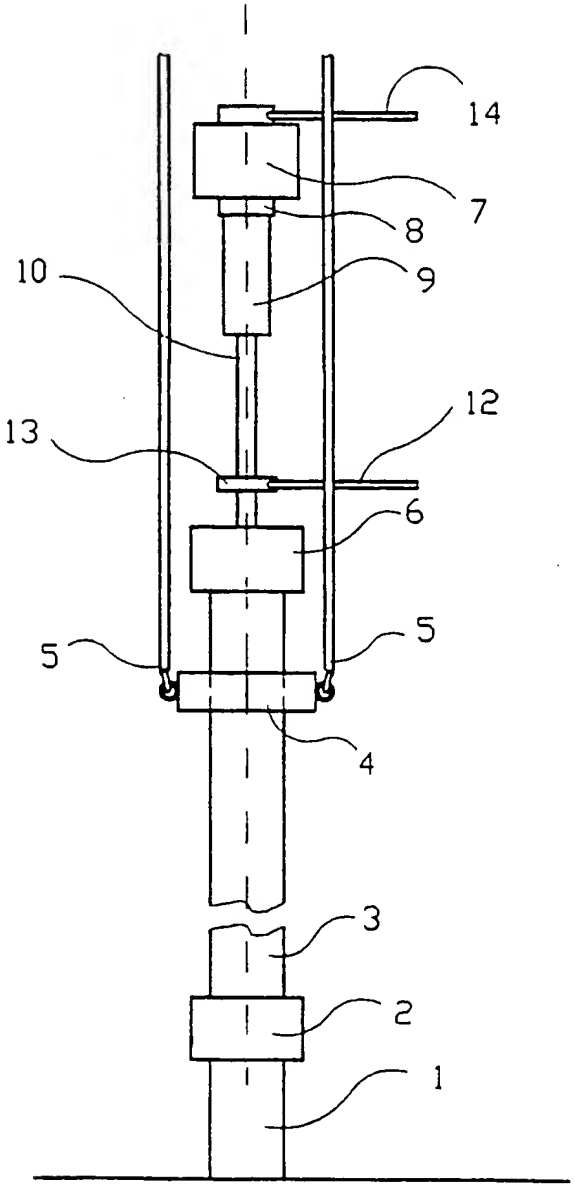

Fig. 5

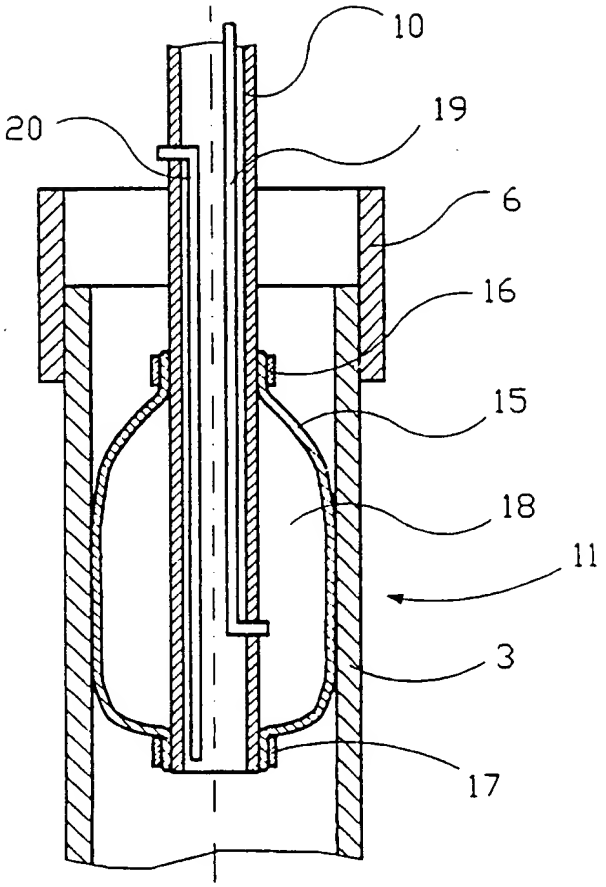

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 97/00244

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E21B 19/16
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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3747675 A (C.C. BROWN), 24 July 1973 (24.07.73) --	1-3
A	US 4655301 A (A.J. VERSTRAETEN), 7 April 1987 (07.04.87) --	1-3
A	EP 0285386 A2 (W-N APACHE CORPORATION), 5 October 1988 (05.10.88) -- --------	1-3

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INTERNATIONAL SEARCH REPORT
Information on patent family members

04/11/97

International application No.
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